In addition to DRAM, the semiconductor IC device and its manufacturing method of this invention can also be adopted for various other types of semiconductor IC devices, such as logic or SRAM (Static Random Access Memory) and other memory devices having MOSFET, CMOSFET, BiCOMSFET, and other structural elements, as well as their manufacturing methods.

Also, for the semiconductor IC device and its manufacturing method of this invention, it is possible to use an SOI substrate or other substrate with the semiconductor layer for forming elements arranged on an insulating film in place of the semiconductor substrate for forming the semiconductor elements, and this invention can be adopted in semiconductor IC devices in the form of combinations of various semiconductor elements, such as MOSFET, CMOSFET, bipolar transistors, etc., and their manufacturing methods.

CLAIMS

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1. A manufacturing method of a semiconductor IC device, characterized by the fact that it consists of the following steps of operation:

a step in which an insulating film is formed on a semiconductor substrate or SOI substrate;

a step in which a first mask film is formed on the aforementioned insulating film;

a step in which, after a resist film is formed on the aforementioned first mask film, the resist film is used as an etching mask to form an opening on the aforementioned first mask film, followed by the formation of trenches on the aforementioned insulating film exposed from the opening;

a step in which, after the aforementioned resist film is removed, a second mask film is formed on the aforementioned semiconductor substrate or SOI substrate;

a step in which, by removing the aforementioned second mask film such that it is left on the side walls of the aforementioned trenches, a side wall made of the aforementioned

second mask film is formed on the side walls of the aforementioned trenches;

and a step in which the aforementioned first mask film and the aforementioned side wall are used as the etching mask in etching off the aforementioned insulating film exposed from the mask, so as to form connecting holes on the aforementioned insulating film.

2. A manufacturing method of a semiconductor IC device characterized by the fact that it consists of the following steps of operation:

a step in which an insulating film is formed on a semiconductor substrate or SOI substrate;

a step in which a first mask film is formed on the aforementioned insulating film;

a step in which, after a resist film is formed on the aforementioned first mask film, the resist film is used as an etching mask to form an opening on the aforementioned first mask film, followed by the formation of trenches on the aforementioned insulating film exposed from the opening;

a step in which, after the aforementioned resist film is removed, a second mask film is formed on the aforementioned semiconductor substrate or SOI substrate;

a step in which, by removing the aforementioned second mask film such that it is left on the side walls of the aforementioned trenches, a side wall made of the aforementioned second mask film is formed on the side walls of the aforementioned trenches;

a step in which the aforementioned first mask film and the aforementioned side wall are used as the etching mask in etching off the aforementioned insulating film exposed from the mask, so as to form an opening on the aforementioned insulating film, followed by the formation of separating trenches on the aforementioned semiconductor substrate or SOI substrate exposed from the opening;

and a step in which an insulating film is buried in the aforementioned separating trenches to form a separating portion.

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3. A manufacturing method of a semiconductor IC device characterized by the fact that it consists of the following steps of operation:

a step in which an insulating film is formed on a semiconductor substrate or SOI substrate;

a step in which a first mask film is formed on the aforementioned insulating film;

a step in which, after a resist film is formed on the aforementioned first mask film, the resist film is used as an etching mask to form an opening on the aforementioned first mask film, followed by the formation of trenches on the aforementioned insulating film exposed from the opening;

a step in which, after the aforementioned resist film is removed, a second mask film is formed on the aforementioned semiconductor substrate or SOI substrate;

a step in which, by removing the aforementioned second mask film such that it is left on the side walls of the aforementioned trenches, a side wall made of the aforementioned second mask film is formed on the side walls of the aforementioned trenches;

and a step in which the aforementioned first mask film and the aforementioned side wall are used as the etching mask in etching off the aforementioned insulating film exposed from the mask, so as to form wiring-forming trenches on the aforementioned insulating film, followed by burying an electroconductive material in the aforementioned wiring-forming trenches to form a wiring layer made of the electroconductive material.

4. The manufacturing method described in Claim 1, 2, or 3, characterized by the fact that in this manufacturing method of a semiconductor IC device, the aforementioned insulating film refers to a silica film, SOG film, PSG film, BPSG film, or a laminated type consisting of these films, with the first mask film and second mask film for the aforementioned [sic]